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ABSTRACT

Between now and 1990, the number of classroom teachers needed in the United States will rise, from 2,380,000 in 1984 to a projected all-time high of 2,640,000 in 1990. Supplying qualified teachers to fill that record number of positions may be difficult, however. Among the reasons that many more teachers may be needed are increased enrollment; a new focus on mathematics, science, and technology; improved teacher-pupil ratios; the provision of new services for special pupils; and increased emphasis on training students for jobs. Among the reasons that teachers may be in short supply are the proliferation of policies to restrict entry into teaching and an erosion of the benefits and image of the profession. Currently, there is a severe shortage of mathematics and science teachers in many states. States have considered several policies to alleviate these shortages. One policy supports incentives, typically through undergraduate scholarship or loan programs, for college students to become science and mathematics teachers. Differential salary scales for mathematics and science teachers have been suggested, as have one-time bonuses. Other policies considered seek to link mathematics and science teaching more closely with industry. Several key policy considerations raised by teacher shortages are also discussed. (JMK)

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24. Teacher Shortages in The Next Decade

The Issue

Between now and 1990, the number of classroom teachers needed in this country will rise, from 2,380,000 in 1984 to a projected all-time high of 2,640,000 in 1990. Supplying qualified teachers to fill that record number of positions may be difficult, however. Among the reasons that many more teachers may be needed are increased enrollment, a new focus on mathematics, science and technology, improved teacher-pupil ratios, the provision of new services for special pupils and increased emphasis on training students for jobs. Among the reasons that teachers may be in short supply are the proliferation of policies to restrict entry into teaching and an erosion of the benefits and image of the profession. The purpose of this Issuegram is to explain why shortages are occurring -- or will occur -- and to outline what policies are being considered to alleviate them.

National Statistics

The demand for teachers. In 1970 there were 2,290,000 classroom teachers in the nation. This number grew to 2,490,000 in 1977 despite an enrollment decline of 2,500,000 students during the same period. The increase occurred for two reasons. First, initial enrollment declines were often used to

relieve over-crowded classroom conditions; second, many additional teachers were hired to meet the needs of special students. That is, improvements in teacher-pupil ratios and in education services more than offset declines in enrollment. But in the late 1970s, the effects of declining enrollments finally overwhelmed the effects of increasing teacher-pupil ratios. The number of teachers declined by 50,000 between 1977 and 1980 and the demand for new teachers fell. Affecting the total demand for "additional teachers," those not employed as teachers during the previous year, are enrollment changes, changes in teacher-pupil ratios, and the need to replace teachers who leave the field. The cumulative demand for additional teachers fell from 896,000 in the 5-year period 1971-75 to 728,000 in the 1976-80 period. The demand for additional teachers is expected to continue decreasing from 1981-85 as enrollments continue to decline. By the late 1980s, however, when enrollments are expected to rebound, the demand for additional teachers is expected to rise. According to the projections of the National Center for Education Statistics, 983,000 teachers will be hired from 1986 to 1990.

The supply of teachers. The supply of additional teachers consists of new graduates and of former teachers not employed as teachers in the previous year. The number of graduates of teacher-training programs decreased from 314,000 a year in 1971 to 159,000 a year in 1980. This number is projected to increase to 238,000 a year in 1990, an estimate based on the assumption that, as the demand for additional teachers increases during the 1980s and teacher salaries rise, more college students will elect to teach. This projected increase needs to occur in spite of expanded career opportunities for women and minorities. Potential additional teachers who are former graduates of teacher-education programs constitute the "reserve pool." Limited data make it difficult to gauge the size and shape of this pool, but it is estimated to contain approximately 1,000,000 former teachers. Few of the 1,000,000, actively seek teaching jobs, however -- perhaps only 120,000 according to 1980 estimates made by the National Education Association.

The National Center for Education Statistics projects that the demand for additional teachers in the 1986-90 period will average 197,000 a year, while the supply of new teachers will average 203,000 a year. However this estimate depends heavily on an increase in the percentage of college graduates who become teachers. If the percentage does not increase beyond the 1980 level of 17%, then the supply of new graduates will fall short of demand by approximately 40,000 teachers a year. At that juncture, unless large numbers of former teacher

graduates in the reserve pool can be induced to join the teaching force, teacher shortages will occur.

The Shortage of Mathematics and Science Teachers

The shortage of mathematics and science teachers needs no statistical projections to make itself known. But some current national and state statistics may help illustrate its severity. Nationally, 34% of high school sophomores are taking remedial courses in mathematics and science, and 25% of the mathematics courses in public colleges and universities are remedial. Twenty-two percent of the teaching vacancies in science and mathematics reported for the 1980-81 school year were filled by teachers prepared in other fields. State figures tell a similar story. The number of emergency certificates issued to mathematics teachers in Missouri between 1978 and 1979 increased 43%. In 1979-80, North Carolina reported that 45% of its mathematics teachers were not certified to teach mathematics. In 1980, Virginia reported a 38% gap between jobs available and teaching graduates prepared in mathematics.

Salaries for mathematics and science teachers that are not competitive with salaries in industry, unfavorable working conditions, and the fact that many states in the late 1960s eliminated mathematics and science requirements for high school graduation are significant factors in the shortage of competent teachers. Whatever the reasons for the shortage, its consequences could be severe since it comes at a time when the need to understand mathematics and science is growing and the economic health of the nation depends heavily on technological sophistication. Dr. Glen Seaborg, distinguished chemist and winner of the Nobel Prize, recently characterized the shortage of teachers and its impact as "unilateral economic disarmament."

The extent of the shortage. State policy makers frequently want to know whether there is a shortage of mathematics and science teachers in their states and, if so, how big the shortage is. Few states have collected teacher supply-and-demand information by subject area on a regular basis and national statistics do not reveal this type of information from the appropriate sources by state. As a consequence, describing the situation in each of the 50 states is difficult. There are two sources of information, however: a survey of 65 university placement offices conducted by the Association for School, College and University Staffing and a survey of directors of teacher education and certification in each of the 50 state departments of education reported by Trevor G. Howe and Jack A. Gerlovich. The university surveys compiled teacher supply-and-demand information for 38 teaching

areas; the survey of the state departments of education compiled information only on mathematics and science teachers. Both surveys indicated a shortage of mathematics teachers in almost every state and region and in many places a critical shortage. Both surveys found lesser but significant shortages of chemistry and physics teachers in all regions of the country and in more than 85% of the states. The supply of teachers of biology, general science and earth science was found to vary significantly across regions and states, making broad generalizations impossible. The survey of university placement offices also found widespread shortages in special education and vocational education.

State policy options. States have considered three types of policies to alleviate the shortage of mathematics and science teachers. The first provides incentives for college students to become mathematics and science teachers, typically through undergraduate scholarship or loan programs. Scholarships could be given to students who commit themselves to teach mathematics or science in public schools for a number of years. Loans would carry with them a subsidized interest rate or an amount forgiven for each year that students teach in public schools. Some states have considered establishing programs to reimburse the cost of graduate tuition for teachers who wish to retrain in a new subject and who would teach the new subject in the public schools for a certain number of years.

Policy makers have also considered ways to make teaching science and mathematics more attractive. Differential salary schedules for mathematics and science teachers and one-time bonuses for people interested in teaching mathematics and science have been considered. So have ways to minimize discipline problems, burnout, and lack of recognition. Other policies that have been considered seek to link mathematics and science teaching more closely with industry. Guarantees of summer jobs in industry, affiliations of teachers with particular industries that lead to full-time employment in industry after a number of years of teaching, and cooperative teaching/industry positions are among the specific approaches under discussion.

Over the long term, approaches like these could increase the number of science and mathematics teachers. However, since each approach requires time to be effective, there may be no short-term solution to the problem of mathematics and science teacher shortages.

Quantity/Quality Policy Conflicts

Over the last five years many states have established policies to raise the quality of teaching which may in some ways conflict with their need to increase the number of teachers. Although the measures designed to improve teacher quality have been quite varied, they generally have been regulatory in nature. Teacher licensing, competency tests, the addition of classroom observation and extensive evaluations to the certification and recertification processes, extended periods of preparation with longer clinical experience -- all these policies (and others that states have instituted) may indeed help improve teaching.

But, collectively, they may also discourage potential teachers, because they interpose barriers between eager undergraduates and the teaching profession. In mathematics and science, as well as in all other areas, the added requirements can only further erode the attractiveness of the teaching profession. So, unless policy makers provide incentives for good teachers as well as barriers to keep out bad ones -- "magnets" as well as "screens" -- the shortage of mathematics and science teachers may only be the tip of the iceburg. (For a more complete introduction to issues of improving teacher quality, please see ECS Issuegram No. 23, State Policies to Screen and Attract Teachers.)

Key Policy Considerations

States are only now beginning to consider the implications of teacher shortages. Many policies are now being discussed, but few are actually in place; if states have acted at all, they have acted only recently. Since state experience is still limited, evaluation of the effectiveness of state policies is not yet possible. Nonetheless, states are even now beginning to recognize some of the key policy considerations raised by teacher shortages.

- State-specific information. When states assemble information on the supply of teachers and the demand for them, this information should be state-specific. National and regional studies, while generally valuable, do not provide enough information to make state policy. The information states need can generally be put together by the state department of education or by the institutions of higher education that graduate teachers.

- Other Possible shortages. The current shortage of teachers in mathematics, science and vocational education is generally recognized and acknowledged. However, many states

also face impending shortages of other types that should be recognized. Elementary school teachers, teachers of exceptional children and teachers of foreign languages and language arts may soon be in short supply. Also diminishing in number are talented women and minority teachers. The education profession has drawn heavily upon these types of teachers in the past but may have to do without many of them in the future.

- o Effect of standards on shortages. In Florida, an education standards committee wrestled with the teacher quality policies that the state had put into effect. "The Commission would urge that the state resist the temptation to lower the standards for those entering the profession in order to increase the available supply of teachers and, consequently, lose the ground which we have gained with so much difficulty. However, our enthusiasm is tempered with pragmatism. Now is not the time to raise standards further" (The Education Standards Commission, June 1982, p. 2).

- o Incentives for teachers. Major attention must be paid to increasing the attractiveness of the teaching profession. Paying teachers more is one strategy, but attention must also be given to improving the public image of teachers and teaching. One possibility for states to consider is restructuring the teaching profession in ways that combine better standards and incentives.

Unfortunately, improving the quality of teachers and increasing the number of teachers will take time. It seems likely that the problems teacher shortages create will get worse before they get better.

What to Read

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